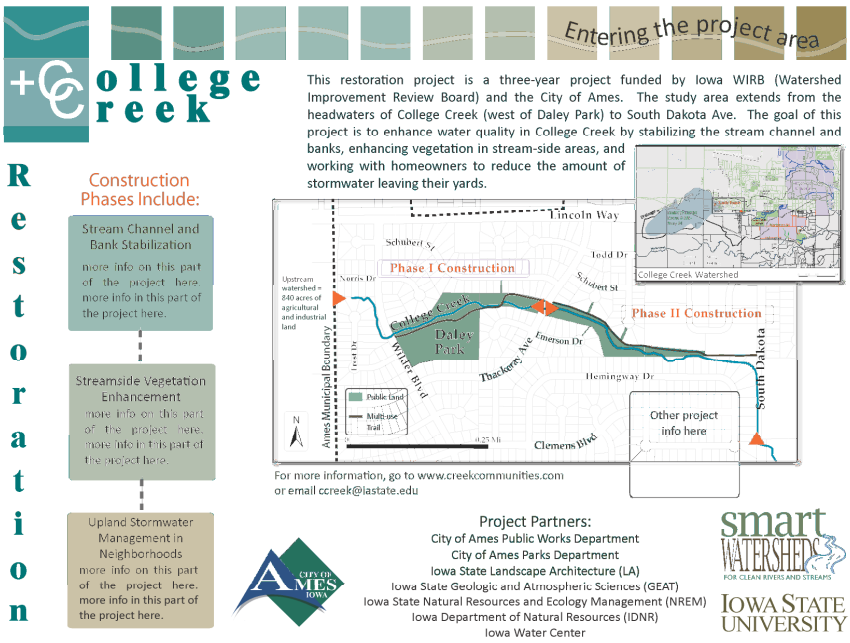
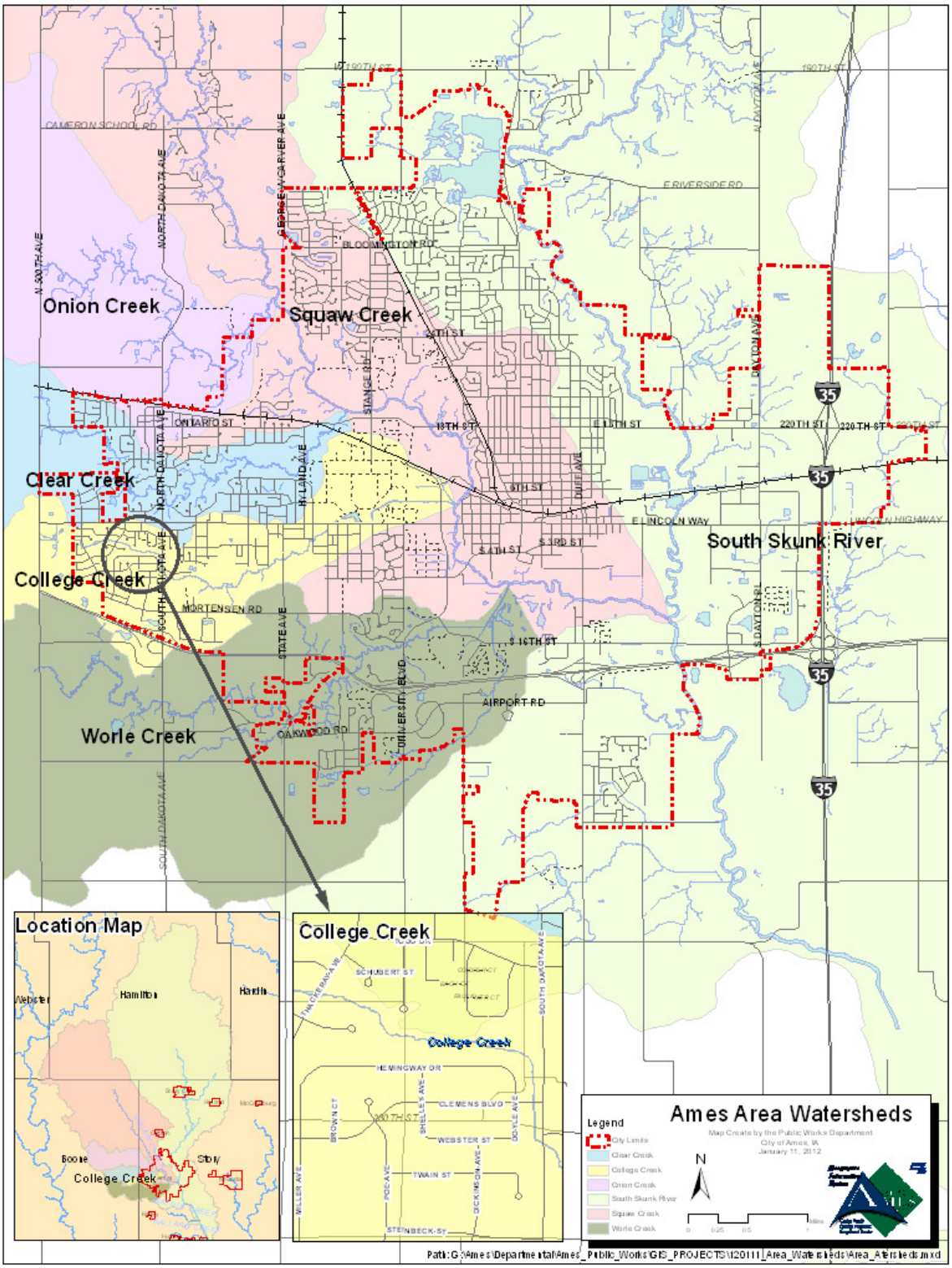


College Creek Watershed Improvement Project Ames, Iowa

Project Final Report

Project Number: 7025-010


Onion Creek
Squaw Creek
Clear Creek
College Creek
Worle Creek
South Skunk River
Location Map
College Creek
Ames Area Watersheds
Legend
Webster
Hamilton
Hardin
Boone
Story
BLOOMINGTON RD
E LINCOLN WAY
LINCOLN HIGHWAY
AIRPORT RD
OAKWOOD RD
MORTENSEN RD
ONTARIO ST
SCHUBERT ST
HEMINGWAY DR
CLEMENS BLVD
WEBSTER ST
TWAIN ST
STEINBECK ST

Project Name: College Creek Watershed Improvement Project
Project Sponsor: City of Ames
Length of Project: January 1, 2008 to December 31, 2010
Total WIRB Funds awarded for this project: $304,335
Project Number: 7025_010

Project objectives

- Administer project and implement all activities and objectives in the project
- Integrate residents and recreational users with project technical staff in the process of design, planning, and construction of stream, riparian and upland water quality enhancement practices
- Engineer/design water quality enhancement practices; practices included are engineering-sound, biologically-friendly, and sensitive to the public's sense of aesthetics and interest in native plant communities
- Construct stream channel and stream bank stabilization and riparian enhancement
- Monitor and evaluate outcomes; changes in storm water runoff quantity and quality and stream bank stability will be measured

Program Accountability

Eroded soil is one of the most commonly identified pollutants in Iowa streams and lakes. The sources of erosion include both upland areas as well as stream bank erosion. This project has focused on a neighborhood and community concerned about an unstable segment of College Creek in Ames Iowa. Soil loss due to stream bank erosion was substantially reduced in this west Ames neighborhood through collaboration between neighbors, city and state officials and Iowa State University researchers and students. Future flooding risk was also reduced. Design and construction costs were shared between Iowa Watershed Improvement Review Board (WIRB) and the City of Ames as a part of the 3-year public outreach project.

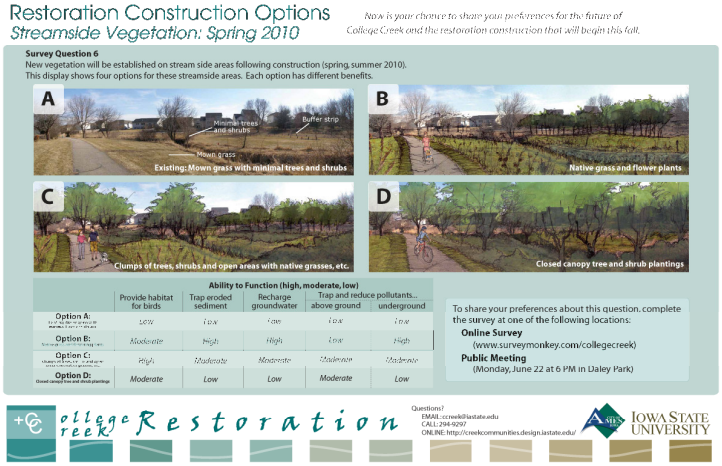
An urban stream assessment completed in 2006 estimated 460 tons of soil erosion from stream bank and gully erosion were being produced annually from College Creek, one of four tributaries draining through Ames. One particular segment of unstable stream conditions was located between Daley Park and South Dakota Avenue. At the beginning of the project in 2008, this 3400 LF (.64 mile) segment was estimated to be contributing 222 tons of soil erosion to College Creek annually. The segment was identified as "widening and down cutting," meaning that large sections of bank were caving in and collapsing due to the volume and intensity of runoff reaching the channel. Without intervention, the channel bottom would naturally have continued to deepen and the banks fail, eroding vast amounts of sediment each year until it reached the size needed to handle the stormwater being delivered. Simply lining the banks with rock or plants to stabilize would not have solved the problem. This section of the stream was located in both public and private ownership, with the most unstable portions located on public property. City officials successfully applied for Iowa WIRB funds to reconstruct the stream channel and banks, short-circuiting the erosion process and immediately improving in-stream habitat conditions.

- **Integrate residents and recreational users with project technical staff in the process of design, planning, and construction of stream, riparian and upland water quality enhancement practices**

The goal of this collaborative effort was to reduce future bank erosion and restore a stable stream channel on this section of College Creek. The first step after securing funding for this construction was to listen to the priorities of the neighborhood and community in terms of goals for habitat and water quality enhancement alongside the restored channel. The site has high visibility because a high-use public shared use path follow the entire length of the stream.

During the neighborhood Creek Chats, the public was charged with creating a vision statement for the project. A vision, including proposed sketches of the channel and near-stream area, was prepared based on public input by ISU. The full vision statement is located on the City's website (http://www.cityofames.org/index.aspx?page=1047).

The residents were presented with three design alternatives in regards to the streambank stabilization. The following signs were placed along the project site area's shared use path for residents to study. The minimum amount of rock rip-rap needed to reduce erosion at the water's edge and preservation of large existing trees near the stream was the desired option.



- **Engineer/design water quality enhancement practices; practices included are engineering-sound, biologically-friendly, and sensitive to the public's sense of aesthetics and interest in native plant communities**

Creek Chats with the neighborhood were held on various topics, including invasive riparian plant removal, urban wildlife, frogs and toads, bird life and habitat, prairie walk, groundwater quality, history of College Creek, vegetated filter strip construction, stormwater garden construction, stormwater garden maintenance, stream condition, water quality, stormwater runoff research results, and engineering design of stream restoration. They were hosted at locations within their neighborhood, so residents could walk or ride their bicycle to the event. As can be seen in the photo below, residents of all ages took an interest in the Creek Chat topics.

Photo 1. The theme of a public "Creek Chat" focused on results of the 2009 frog and toad inventory. ISU student Landscape Architecture student Brett Seelman, responsible for analysis of digital frog calls, shares research findings and examples of sound recordings made with Ames residents; neighborhood children shared frogs they collected from the stream area.

- **Construct stream channel and stream bank stabilization and riparian enhancement**

Stream channel reconstruction occurred during summer 2010 and resulted in the removal of 4000 cubic yards of soil from the channel area. A length of 4,255 total feet of stream bank was stabilized including some areas with a two-stage channel cross section. This created more room for the stream to move, store floodwater and provide stream-edge habitat. Erosion estimates for this section of College Creek were reduced 74% following construction compared to pre-construction measurements. Four acres of publicly-owned mown lawn was replaced with native prairie, shrub and tree plantings following construction.

While Ames has many reasons to be proud of its natural resources, this project is an important accomplishment. Three years after beginning, this section of College Creek is

yielding an estimated 165 fewer tons of soil and is more stable. The public walking path offers views of the restored stream channel and native plant filtering buffer. Also important, multi-disciplinary collaboration and cooperation led to a successful first experience with stream channel and riparian restoration in Ames. This experience opened the doors of possibility within this community in terms of cooperation between engineering, restoration sciences and the design of public open space.

Photo 2. The segment of College Creek included in this report was highly eroding. The channel bottom was actively down cutting and stream banks failing.

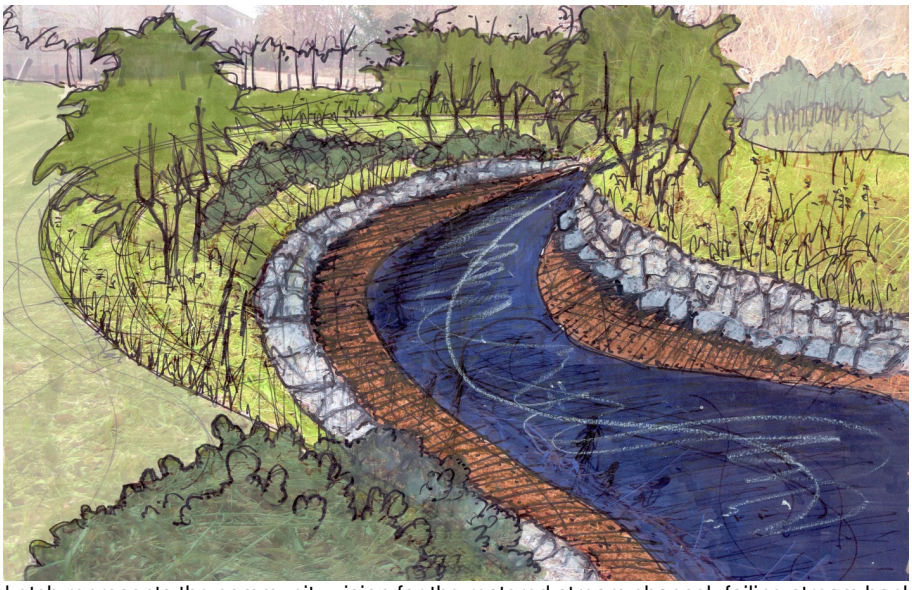


Photo 3. This sketch represents the community vision for the restored stream channel: failing stream banks are replaced with the minimum amount of rock required, the channel bottom is wider and more stable and mown lawn near the stream is replaced with native vegetation.

Photo 4. Post-construction view of the restored stream channel shows mature trees salvaged, the two-stage channel and near-stream areas seeded and planted with native vegetation.

Both volunteer and technical water quality monitoring of Iowa streams, including College Creek, indicate persistently high concentrations of bacteria and nutrients such as nitrogen. Monitoring also indicated that pollutant concentrations tended to increase within urban areas compared with upstream rural portions of the watershed. Faced with these results, residents of Emerson Drive cul-de-sac in Ames agreed to coordinate construction of stormwater treatment practices in their yards to filter stormwater runoff from their roofs and yards before it entered the storm drain system leading to College Creek.

The goal of this community-university research effort was to capture and treat the first 1.25 inches of rainfall (per acre) occurring in a given storm, eliminating this drainage reaching the storm drain system. ISU faculty and students coordinated with homeowners to both construct the bioretention cells used to treat the stormwater, as well as to measure the amount of water leaving their cul-de-sac before and after construction. Faculty and students first installed flow meters in the storm drain pipe draining the cul-de-sac one year before construction began. Flow meters continuously monitor and record the amount of water flowing through the pipe. A second flow meter was installed in a similar adjacent cul-de-sac and used as the “control” area where no stormwater practices were installed.

Residents and students constructed 18 bioretention cells on private property. The cells were designed to appear as landscaped areas with local rock and native vegetation. Each cell included a 3’ deep excavated hole that was backfilled with an engineered soil mix, planted, edged and mulched. Iowa engineering standards suggest this practice is effective in removing 65-100% of phosphorus, metals and bacteria as well as 30-65% of nitrogen and hydrocarbons from the stormwater they infiltrate. Bioretention cells were positioned in places to intercept the maximum amount of roof, driveway, and lawn

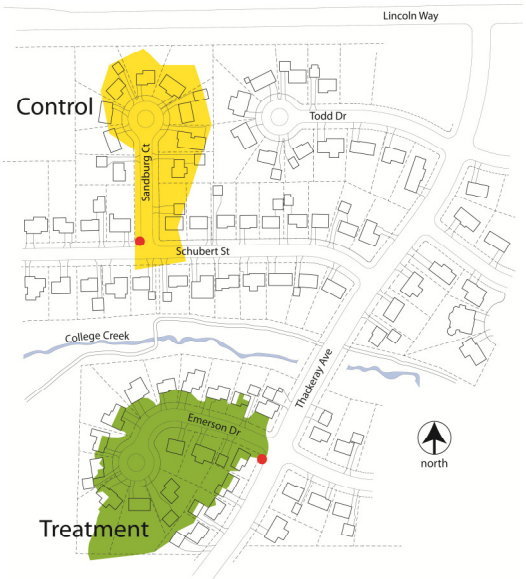
drainage possible. This enabled them to treat as much stormwater as possible while also reducing the quantity of stormwater released directly to the stream.

Fourteen Emerson Drive homeowners (all but one) agreed to participate in the research project. The average bioretention cell construction cost was $609, not including labor. Of the total drainage area entering the storm drain system and College Creek, bioretention cells were constructed to capture and treat 80% of the roof drainage and 54% of lawn areas. The 18 cells constructed totaled 2,128 square feet in size with an average size of 136 square feet.

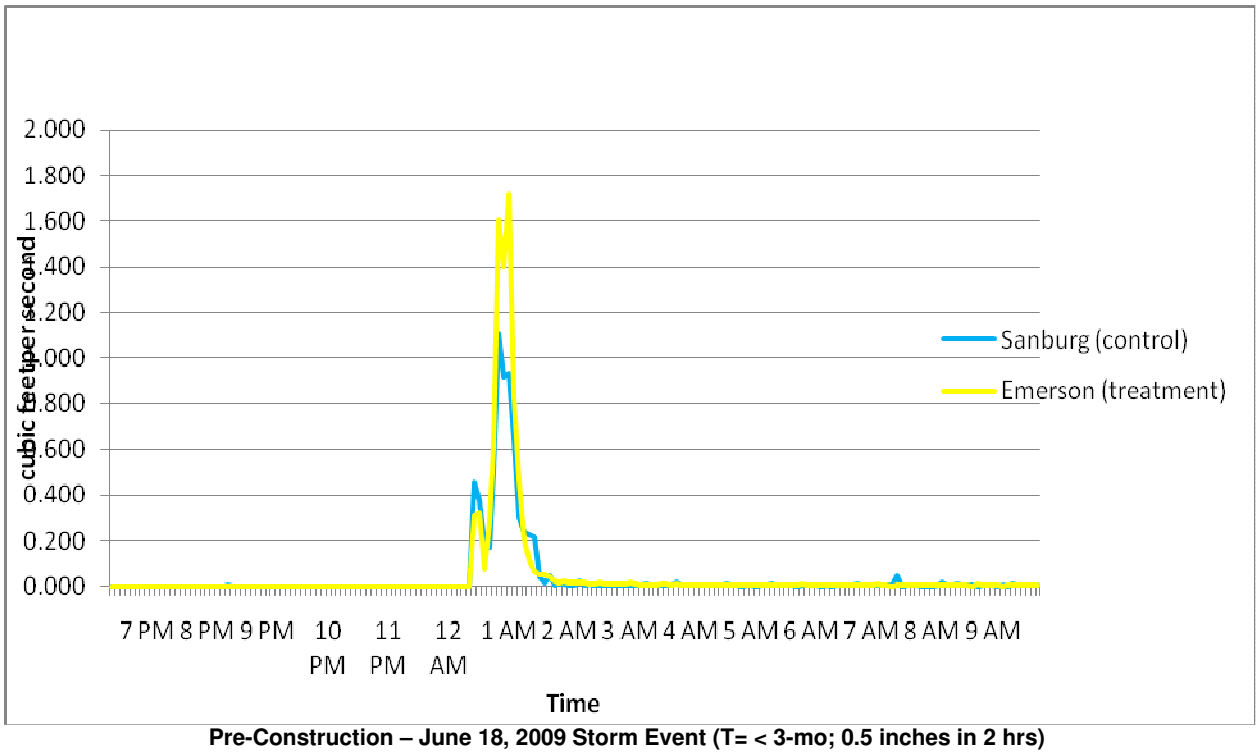
- **Monitor and evaluate outcomes; changes in storm water runoff quantity and quality and stream bank stability will be measured**

Post-construction, significantly less stormwater entered College Creek from the Emerson Drive cul-de-sac compared to the control area. Flow meters measured a 70% reduction in stormwater volume reaching the storm drain during the first inch of rainfall compared with the control area. When rainstorms were larger than 1.25 inches, measured stormwater flow was identical between the two sites. As designed, this feature assures homeowners that bioretention cells won't contribute to flooding in the event of large rainstorms — excess water enters the storm drain system as originally constructed. Importantly, near-record Ames rainfalls in August 2010 did not damage the bioretention cells or cause flooding. There is a good indication that with full plant establishment, the effective rate may increase for these best management practices.

The Emerson Drive homeowners reported a sense of satisfaction with their contribution to water quality enhancement. They appreciated having "hard data" demonstrating their efforts have paid off in terms of converting stormwater runoff to groundwater infiltration. Homeowners also acknowledged the amount of labor they invested in the bioretention gardens as well as the no-cost aspect of the project to them.

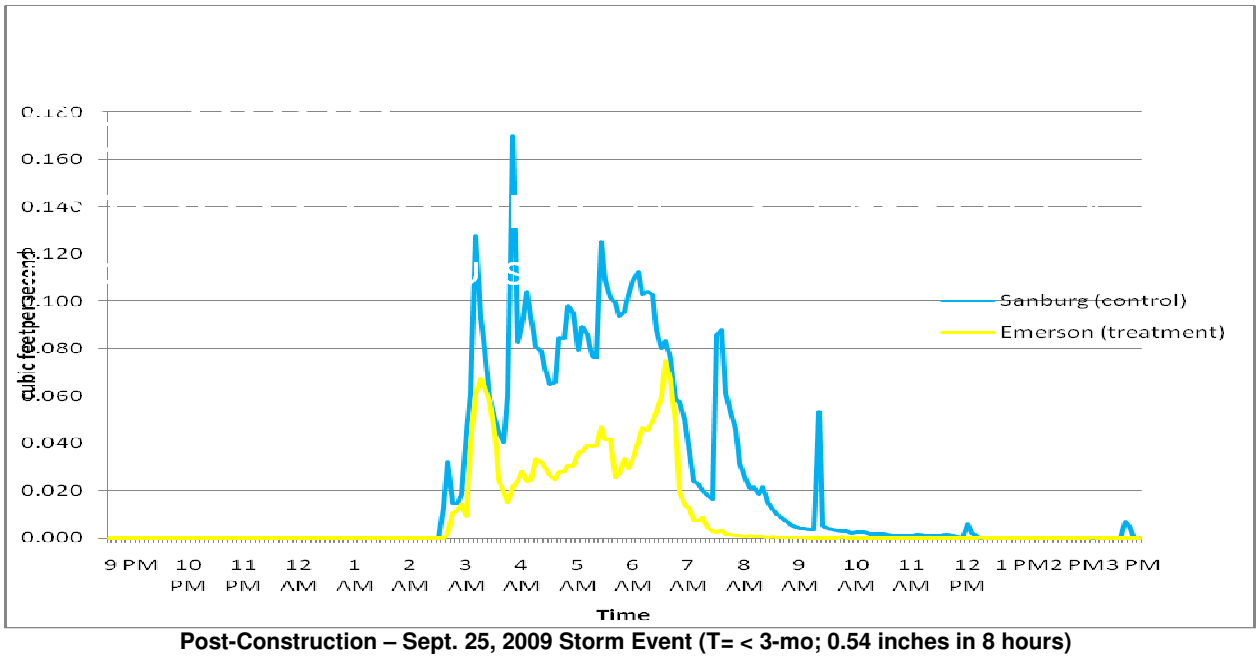


Base Map 1. Study site depicting both the stormwater treatment and control areas



Pre-Construction – June 18, 2009 Storm Event (T= < 3-mo; 0.5 inches in 2 hrs)

Pre-construction stormwater runoff monitoring indicated the treatment area (Emerson Drive cul-de-sac show in yellow) shed more water than the control area (shown in blue.



Post-Construction – Sept. 25, 2009 Storm Event (T= < 3-mo; 0.54 inches in 8 hours)

Post-construction stormwater runoff monitoring demonstrated the treatment area (Emerson Drive cul-de-sac show in yellow) shed far less water than the than the control area (shown in blue) as water was captured in the bioretention cells rather than entering the storm drain system.

Photo 5. Completed and planted bioretention cell on Emerson Drive.

Financial Accountability

Table 1. Watershed Improvement Funds

Grant Agreement Budget Line Item	*Total Funds Approved ($) Per Original Agreement*	*Total Funds Approved by Amendment ($)*	*Total Funds Expended ($)*	*Available Funds ($)*
Information/Education	$12,000	$12,000	$12,000	$0
Engineering – Design	$30,000	$59,831	$59,831	$0
Project Administration	$15,766	$21,509	$21,509	$0
Travel Expenses	$1,053	$1,053	$1,053	$0
Supplies	$216	$216	$216	$0
Stream Channel and Bank Stabilization	$210,000	$164,560	$164,560	$0
Storm Water BMP Installation	$11,250	$10,125	$10,125	$0
Riparian Buffer Strip	$11,250	$9,690	$9,690	$0
Water Quality Monitoring (samplers)	$11,860	$17,107	$17,107	$0
Water Quality Monitoring (sampling)	$940	$8,244	$8,244	$0
Totals	$304,335	$304,335	$304,335	$0
Difference	0	0	0	0

Table 2. Total Project Funding

Funding Source	*Cash*		*In-Kind Contributions*		*Total*	
	Approved Application Budget ($)	*Actual ($)*	*Approved Application Budget ($)*	*Actual ($)*	*Approved Application Budget ($)*	*Actual ($)*
WIRB	$304,335	$304,335	$0	$0	$304,335	$304,335
City of Ames	$242,000	$240,703	$0	$5,655	$242,000	$246,358
ISU	$0	$0	$19,840	$21,260	$19,840	$21,260
Homeowners	$22,500	$0	$7,200	$9,786	$29,700	$9,786
Total Project Cost					$595,875	$581,739

WIRB Contribution: WIRB Application = 51% Actual = 52%

Environmental Accountability

Table 3. Practices and Activities

Practice or Activity	*Unit*	*Approved Application Goal*	*Approved (Amended) Goal*	*Accomplishments*	*Percent Completion*
Design Workshops	No.	N/A	N/A	3	100
Creek Chats/Neighborhood Circles	No.	30	30	24	100
Stream Channel, Bank Stabilization	LF	4,095	4,255	4,255	100
Upland Stormwater Practices	Ea.	45	41	41	100
Riparian Enhancement	Ac.	90	3	3	100
Water Quality Monitoring (2 in-pipe and 3 in-stream samplers)	No.	5	5	5	100
Water Quality Monitoring (water sample analysis)	(See Surface Water Quality Monitoring Final Report)				

Table 4. Environmental Impact

Practice or Activity	*Rain Garden*	*Streambank Stabilization*	*Filter Strip*
Sediment Reduction (t/y)		166	
Nitrogen Reduction (lb/y)	1.18	465	3
Phosphorus Reduction (lb/y)	0.96	205	0.18
Flow Reduction (%)	70		

Presentations: This project has been presented to several professional and general citizen organizations, including the American Public Works Association (APWA) Iowa Chapter 2010 Fall Conference, City's annual EcoFair (formerly Clean Water Festival), and the Ames Citizen Academy. Copies of the presentation and the project poster can be viewed at the following website (http://www.cityofames.org/index.aspx?page=1047).

Award Winning Project: In 2011, this project was recognized with the Award of Excellence from the Central States American Society of Landscape Architects. Mimi Wagner, Iowa State University, accepted the award on our behalf.